which will result in industry-adopted technical requirements and standards for CALEA. This document is also intended to assist law enforcement agencies that conduct electronic surveillance and manufacturers of electronic surveillance equipment.

## 1.3 Document Structure

Section 1 describes the purpose, scope, and intended audience of this document.

Section 2 provides an overview of a network-based electronic surveillance capability and the ESI. It also defines key terms used throughout the document.

Section 3 specifies the requirements for the general characteristics of the ESI.

Section 4 provides the requirements on various physical interfaces for delivering call content and call-identifying information.

Section 5 details the requirements for the delivery of call content.

Section 6 provides the requirements for the delivery of call-identifying information.

Section 7 specifies the requirements for the ESI messaging protocol, the Surveillance Interface Message Protocol for Law Enforcement (SIMPLE). The SIMPLE requirements describe the messages that should be supported for delivering call-identifying information, message parameters, and parameter values. These requirements also describe the conditions for message generation and delivery.

The glossary and list of acronyms define terms and acronyms used throughout the document.

A list of references is also included.

## 1.4 Requirement Labeling Convention

The following conventions are used in this document to define ESI requirements:

> Every requirement is labeled with "Rn-m", where "n" is the current section number, and "m" is a sequence number. The sequence number "m" starts again at 1 within every section that contains a requirement.

For example, the following is the first requirement in Section 3.

> **R3-1 For the ESI, CCCs and CDC shall be supported over separate logical channels.**

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# 2. Electronic Surveillance Framework

This section provides an overview of a network-based electronic surveillance capability and the ESI envisioned by law enforcement. Also, key terms used throughout the document are defined.

## 2.1 Electronic Surveillance Capability

The delivery of call content and call-identifying information is one function of a multifunctional, network-based, electronic surveillance capability provided to law enforcement by a TC.

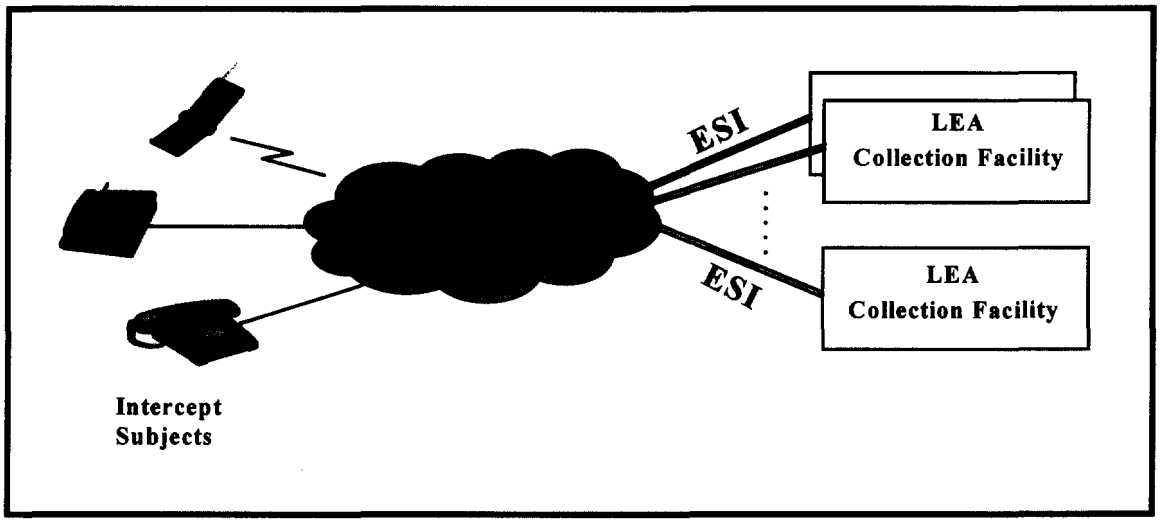


**Figure 1:** Network-based Electronic Surveillance Capability

The network-based electronic surveillance capability is depicted in Figure 1. This capability is provided by the TC for an LEA pursuant to an order or lawful authorization for electronic surveillance on the equipment, facilities, or services of an identified subscriber (represented as "Intercept Subjects" in Figure 1). When this capability is initiated, the appropriate call content and call-identifying information of the subject are delivered to the LEA over the ESI.

## 2.2 Functional Reference Model

Figure 2 is a functional representation of the overall network-based electronic surveillance capability and a high-level depiction of the four major functions associated with the capability and the interconnections among the functions. These functions are described in the subsequent paragraphs.

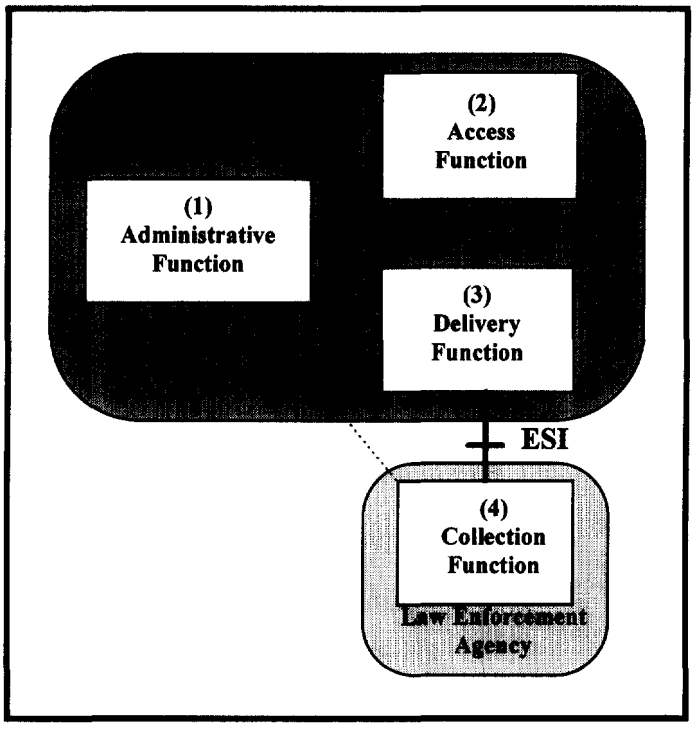


**Figure 2:** Functional Reference Model

1. Administrative Function — processes surveillance orders, controls electronic surveillance capability, activates/deactivates access functions as required by an LEA, activates/deactivates delivery functions as required by an LEA, and manages security. This function also includes the ability to expeditiously assist law enforcement for the duration of a surveillance. This assistance includes restoring surveillance capability after system and/or service failure.

2. Access Function — isolates and accesses a subject's call content and call-identifying information unobtrusively, and provides information to the delivery function.

3. Delivery Function — securely delivers call content and call-identifying information to the appropriate LEA collection facility, and distributes call content and call-identifying information to multiple LEAs.

4. Collection Function — LEA function that collects and processes call content and call-identifying information received over the ESI from a TC network.

A TC network performs the administrative, access, and delivery functions to meet the electronic surveillance needs of the LEA. An LEA will control and manage the collection function. It is important to note that the three functions within the TC network may be implemented in a number of different physical configurations. Law enforcement makes no assumptions about the physical implementations chosen by TCs.

## 2.3 Key Definitions

This subsection defines key terms used in this document. Understanding these terms is essential to understanding the ESI requirements. A complete glossary of terms is provided at the end of the document.

**Associate**
A subscriber whose equipment, facilities, or services are communicating with a subject.

**Call**
Instance(s) of audio/data to and from a subject and the associated signaling information. A call starts when a subject originates a call from an idle state or an incoming call attempt occurs. A call ends when all instances of communications associated with that call terminate.

**Call Content**
With respect to any wire or electronic communications, call content includes any communication of a subject. Call content applies to any type of wire or electronic communications sent by or to the subject (i.e., any transfer of messages, signals, writing, images, sounds, data, or intelligence of any nature).

**Call Content Channel (CCC)**
The logical link between a TC network supporting the electronic surveillance capability and the LEA collection facility. The CCC carries the intercepted call content passed between a subject and one or more associates.

**Call Data Channel (CDC)**
The logical link between a TC network supporting the electronic surveillance capability and the LEA collection facility. The CDC carries the intercepted/acquired call-identifying information related to a subject's call activities.

**Call-identifying Information**
Dialing or signaling information that identifies the origin, direction, destination, or termination of each communication generated or received by a subscriber by means of any equipment, facility, or service of a TC.

**Communications**
Communications, as used herein, refers to the communications *content.* It includes "electronic communications," as defined in 18, U.S.C. 2510(12), any transfer of messages, signals, writing, images, sounds, data, or intelligence of any nature transmitted in whole or in part by a wire, radio, electromagnetic, photoelectric, or photo-optical system, etc. As used herein, the term also includes "wire communications," as defined in 18, U.S.C. 2510(1).

**Intercept Access Point (IAP)**
A point within a TC network where the call content and/or call-identifying information of a subject is accessed.

**Intercepted Call or Call Attempt**
As used in this document, refers to a call or call attempt to or from a subject.

**Subject**
The *equipment, facilities, or services of a subscriber* whose incoming, outgoing, and redirected communications and/or call-identifying information is to be accessed and delivered to law enforcement pursuant to a court order or lawful authorization.

**Surveillance**
The statutory-based legal authorization, process, and associated technical capabilities and activities of law enforcement agencies related to the interception of wire, oral, or electronic communications while in transmission. As used herein, also includes the acquisition of call-identifying information. As used in this document, "surveillance" refers to a single pen register, trap and trace, or communications interception. Its usage in this document does not include administrative subpoenas for obtaining a subscriber's toll records and information about a subscriber's service that an LEA may employ before the start of a pen register, trap and trace, or communications interception.

**Telecommunications Carrier (TC)**
A person or entity engaged in the transmission or switching of wire or electronic communications as a common carrier for hire, and includes 1) a person or entity engaged in providing commercial mobile service, or 2) a person or entity engaged in providing wire or electronic communications switching or transmission service to the extent that the Federal Communications Commission finds such service is a replacement for a substantial portion of local telephone exchange service. This does not include 1) persons or entities insofar as they are engaged in providing information services, and 2) any class or category of telecommunications carriers that the Commission exempts by rule after consultation with the U.S. Attorney General (Public Law 103-414, Sec. 102(8)).

## 2.4 ESI Overview

As depicted in Figure 3, the ESI is a mechanism for a TC to deliver to law enforcement the call content and call-identifying information that the TC has isolated and is providing access to as part of the electronic surveillance capability. The ESI does this through the physical transportation of the intercepted call content (e.g., voice, packet data, modem data) and the call-identifying information.

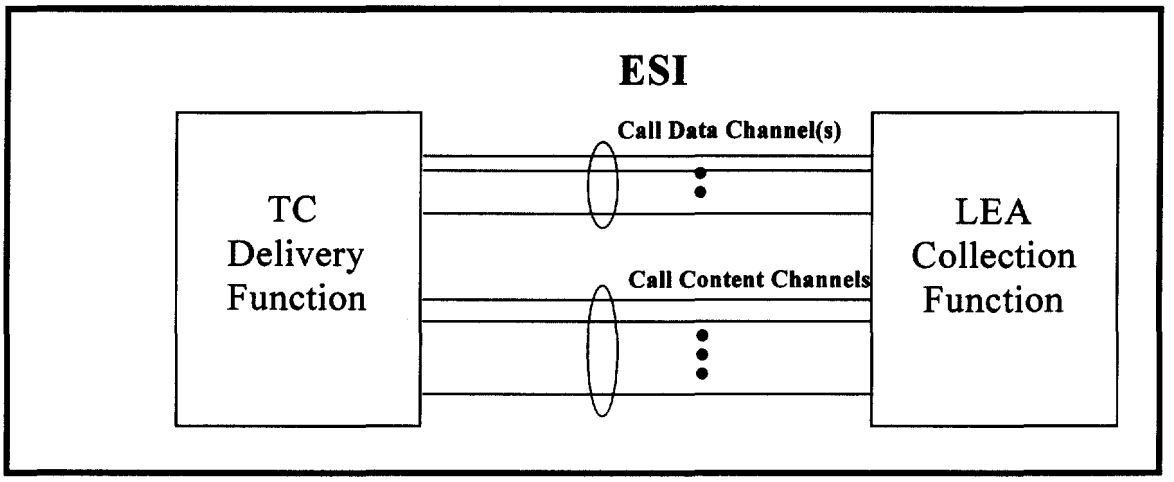


**Figure 3:** Functional Diagram of ESI

Two physical interface options are described for the ESI to accommodate varied TC network capabilities and the electronic surveillance needs and economic constraints of an LEA. The physical interfaces recommended herein are either an analog wireline interface or a 1.544 Mbits/sec Metallic Digital Signal Level 1 (DS1) interface.

### 2.4.1 Delivery of Call Content

A subject's call content is transported to the LEA over one or more CCCs. More than one CCC may be required to deliver the call content for each connection associated with the subject. The actual number of CCCs will vary with each surveillance according to the subject's call capabilities and call-related activities. CCCs can be provisioned as combined (i.e., carrying both the transmit and receive paths for the subject on one channel) or separated (i.e., using independent channels to carry the transmit or receive path of the subject). The LEA will specify the number of CCCs needed for each surveillance. For some types of applications used by the subject (e.g., cellular digital packet data, short message service), the call content may be transported over the CDC.

### 2.4.2 Delivery of Call-identifying Information

Call-identifying information is formatted by a TC network into discrete messages using a specialized protocol called the Surveillance Interface Message Protocol for Law Enforcement (SIMPLE). The SIMPLE messages are transported to an LEA over a CDC. The CDC is physically supported over an X.25 packet data connection. As defined in this document, a single CDC could support the delivery of SIMPLE messages for one or more surveillances to a particular LEA collection facility. For some applications, some of the call-identifying information for a subject may be transported over the CCC (e.g., ISDN D-channel signaling).

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# 3. ESI General Requirements

This section provides the requirements for general characteristics of the ESI, unobtrusiveness, encryption, and distribution to multiple LEAs.

## 3.1 General

The ESI is used to deliver to law enforcement call content and call-identifying information over separate logical channels. The CDC transports call-identifying information for multiple surveillances from each delivery point in the TC's network to a particular LEA location. One or more CCCs deliver the call content for each surveillance. Each CCC is physically transported to law enforcement over a circuit that can support the subject's communications transmissions. The CDC and CCC(s) may be transported to law enforcement over separate physical facilities. The CDC may be multiplexed onto one or more physical facilities.

**R3-1 For the ESI, CCCs and CDC shall be supported over separate logical channels.**

**R3-2 All call content for a subject shall be delivered to an LEA over CCCs. For some applications used by the subject (e.g., ISDN D-channel), call content includes all non-call associated and call associated signaling information.**

**R3-3 All call-identifying information for a subject shall be delivered to an LEA over a CDC. However, for some applications used by the subject (e.g., cellular digital packet data, short message service), the call content of the subject is delivered over the CDC.**

## 3.2 Unobtrusiveness

A subject's call content and call-identifying information should be accessed and delivered unobtrusively.

**R3-4 Delivery of call content and call-identifying information to the LEA shall not give any audible indication to either the subject or associates.**

**R3-5 Delivery of call content and call-identifying information to the LEA shall not deny the availability of any service to either the subject or associates.**

**R3-6 Delivery of call content and call-identifying information to the LEA shall not introduce an incremental delay in any process associated with the subject's or associate's service greater than the typical call-to-call processing delay variance.**

## 3.3 Encryption

An LEA may want to use its own encryption equipment or subscribe to an encryption service from the TC to encrypt the call content and call-identifying information for delivery to the LEA collection site.

**R3-7 If a TC provides encryption service to a subject and possesses the information necessary for decryption, either the TC shall decrypt the subject's call content**

**and call-identifying information or the TC shall provide the LEA with all information necessary to decrypt.**

**R3-8 The TC shall allow an LEA to insert equipment to encrypt the CDC and/or CCC before delivery to the LEA collection facility.**

**R3-9 If a TC chooses to encrypt the call content and call-identifying information before delivery to the LEA, the TC shall make available to the LEA all the equipment and information necessary to decrypt the call content and call-identifying information.**

## 3.4 Distribution to Multiple LEAs

Rare circumstances dictate that the call-identifying information and/or call content associated with a particular subject needs to be delivered to more than one LEA simultaneously. This will occur when different LEAs are conducting independent investigations on the same subject. Separate physical connections should be used to provide the call content and call-identifying information to each LEA.

**R3-10 A separate group of physical connections shall be used to deliver the call content and call-identifying information to each LEA that requests surveillance.**

**R3-11 The TC shall be capable of distributing the call content and call-identifying information associated with a particular subject simultaneously to up to five different LEAs.**

# 4. ESI Physical Delivery Interfaces

This section provides the requirements for various physical interfaces considered for the delivery of call content and call-identifying information. The CDC and CCCs will be transported to law enforcement over specified physical circuits.

Two physical delivery interfaces have been identified to support the ESI. These interfaces include an analog wireline interface and a DS1 interface. TCs should support these delivery interfaces if the access technology is currently available or as it becomes available.

**R4-1 TC shall provide either an analog wireline or a DS1 physical delivery interface as requested by the LEA at the start of a surveillance.**

## 4.1 ESI Analog Wireline Interface

The ESI analog wireline interface is generally, but not necessarily, a line side appearance on a facility that transmits information in the form of a continuous, time-varying voltage. Each ESI analog wireline circuit is a two-wire analog circuit that can transport one bidirectional channel. The phrase "analog wireline interface" describes the characteristics of this delivery interface and does not imply anything about the network element performing the surveillance. The term "wireline" in this context simply distinguishes between analog POTS lines and analog wireless services.

**R4-2 The ESI analog wireline interface shall be supported by all network elements in a TC network supporting the electronic surveillance capability and providing analog wireline service to a subscriber.**

**R4-3 The electrical interface at the delivery point to law enforcement shall be a balanced, metallic pair for each analog wireline circuit.**

## 4.2 ESI DS1 Interface

The ESI DS1 interface is a 1.544 Mbits/sec metallic interface with a trunk side appearance that is widely supported on a variety of telecommunications equipment. The DS1 interface is a relatively wide bandwidth interface that is capable of supporting different bandwidth allocation applications. Because of its flexibility, the DS1 interface meets law enforcement's transport needs for many different types of call content interceptions.

**R4-4 The 1.544 Mbits/sec Metallic DS1 interface shall be supported by all network elements in a TC network supporting the electronic surveillance capability and providing DS1 service or utilizing DS1 trunks for intranetwork or internetwork communications.**

**R4-5 The DS1 interface at the delivery point to law enforcement shall conform to ANSI T1.403, *Telecommunications – Network-to-Customer Installation – DS1 Metallic Interface.***

**R4-6 The electrical interface for the DS1 interface at the delivery point to law enforcement shall be two balanced, metallic pairs. One pair shall be used for each direction of transmission.**

**R4-7 A four-wire DS1 interface connector, known as a "Smart Jack," shall be used to interconnect TC equipment to LEA facilities. Interconnection shall be through one of four Universal Service Order Code (USOC) connectors (RJ48C, RJ48X, RJ48M or RJ48H).**

The DS1 interface is considered a universal transport system that can support the transport needs for surveillance on analog, ISDN BRI, ISDN Primary Rate Interface (PRI), wireless and T1/fractional T1 facilities. Several different bandwidth allocation applications, such as unchannelized DS1, channelized DS1, and ISDN PRI, are available. Unchannelized DS1 transport is envisioned to be used for surveillance on special customer lines, such as point-to-point or customer-multiplexed data facilities.

Subjects using the ISDN PRI may have access to logical bandwidth channelization greater than 64 kbits/sec. Particularly, H0 channels provide 384 kbits/sec service. Other n x 64 kbits/sec channelization ranging from n = 2 (128 kbits/sec) to n = 24 (1.536 Mbits/sec) may also be provisioned for a subject. The significant concern with logical channels greater than 64 kbits/sec is that they must be transported with time slot sequence integrity. Time slot sequence integrity means that user information octets, when transmitted in a digital information stream contained in the "n" time slots of a multislot connection, arrive at the output in the same sequence that they were introduced. This byte sequence must be preserved when multislot channels are transported to law enforcement.

**R4-8 Time slot sequence integrity shall be maintained when transporting n x 64 kbits/sec CCCs to an LEA.**

ISDN packet mode and circuit mode data calls will require clear channel 64 kbits/sec (i.e., unrestricted digital) transport from the delivery point to law enforcement.

**R4-9 The ESI DS1 interface shall support 64 kbits/sec clear channel capability for transporting CCCs on those network elements that provide 64 kbits/sec clear channel capability to a subscriber.**

## 4.3 ESI Internetwork Delivery Interface

Occasionally, the subject's carrier may be unable to deliver the information directly to an LEA (e.g., if the LEA collection site is located at a distance from the TC's delivery point or is outside of the TC's service area). A delivery interface is necessary to support internetwork transfer of CDCs and CCCs.

**R4-10 The TC shall support a delivery interface that is appropriate for internetwork transfer of CDCs and CCCs.**

## 4.4 Availability and Reliability of Delivery Interfaces

Requirements for the availability and reliability of delivery circuits used by the ESI are necessary to ensure adequate performance.

**R4-11 All physical circuits used for the ESI for a surveillance shall remain active and in-service until notified by the LEA.**

# 5. Delivery of Call Content

This section defines requirements for the delivery of a subject's call content to law enforcement. The call content of a subject is transported to the LEA over one or more CCCs. Each CCC is physically supported using one of the physical interfaces described in the preceding section.

## 5.1 Types of Call Content Channels

CCCs can be designated as one of two types: combined or separated. When a single CCC carries both the transmit and the receive communications paths, it is a combined CCC. On the other hand, a separated CCC delivers either the transmit or the receive communications path. Two separated CCCs would be needed to deliver a two-way conversation between a subject and an associate.

**R5-1 The ESI analog wireline and DS1 physical delivery interfaces shall support transport of both combined and separated CCCs.**

The type of CCC delivered to law enforcement may be influenced by facilities serving the subject, the manner in which the subject's call content is accessed and delivered, and the preferences of the LEA conducting a surveillance. Some communications facilities inherently separate the transmit and receive communications paths. On these facilities, delivery of separated CCCs is possible. Other facilities, however, may use a single physical path to carry the combined bidirectional communications associated with a connection. In these cases, only the delivery of a combined CCC is possible.

**R5-2 If a TC network element does not inherently separate the transmit and receive communications paths, call content associated with a single connection shall be delivered to an LEA using a combined CCC.**

## 5.2 Provisioning of Call Content Channels

The number and type of CCCs will be specified by an LEA when the surveillance request is made to the TC. More than one CCC may be required to support a surveillance. The actual number of CCCs will vary with each surveillance depending on the subject's call capabilities and call-related activities.

**R5-3 An LEA shall have the option of specifying the type of CCC (combined or separated) at the activation of a surveillance.**

**R5-4 The number of CCCs shall be provisionable for each surveillance as requested by an LEA at the activation of a surveillance or at anytime thereafter for the duration of a surveillance.**

**R5-5 The TC shall provide an LEA with a description of the mapping between the physical circuit and CCCId at the activation of a surveillance.**

Each CCC is identified by an integer value known as the Call Content Channel Identifier (CCCId). The purpose of CCCId is to uniquely identify each CCC at the LEA collection facility. The CCCId is used in the SIMPLE messages to associate a particular CCC with a call content

source. The channel identifier should be correlated (mapped) by the TC to a physical circuit, channel, or timeslot on the ESI.

**R5-6 Every CCC for a surveillance shall be identified by a distinct CCCId with values ranging from 1 through N, where N is the total number of CCCs requested by an LEA.**

**R5-7 The CCCId shall be assigned at the time of provisioning of CCCs and it shall not change until the surveillance using the CCCs is deactivated.**

## 5.3 Establishment of Call Content Channel Physical Circuits

CCC physical circuits can be established in various ways. The method of circuit establishment is not a primary concern to law enforcement as long as the interface meets the performance expectations defined in this document. Various circuit establishment methods that may be acceptable to law enforcement are listed below:

- Private, dedicated circuits
- Switched, dedicated, nailed-up circuits
- Switched, dedicated, on-demand circuits.

"Private" refers to circuits available on leased transmission facilities. "Switched" refers to circuits routed through a public network. "Dedicated" means that the circuits are dedicated to a particular surveillance at provisioning time. "Nailed-up" refers to a switched connection that is established at the start of a surveillance and that remains active for the duration of the surveillance. An "on-demand" connection is triggered by call activity of a subject.

**R5-8 The TC shall provide a mechanism to establish CCC physical circuits such that they meet or exceed specified performance and reliability requirements set forth in this document for the delivery of call content.**

**R5-9 A continuous signal of DTMF C, commonly known as C-tone, shall be applied on all idle dedicated, nailed-up CCCs.**

## 5.4 Assignment and Activation of Call Content Channels

When the CCCs have been provisioned and established for a surveillance, the CCCs must be assigned and activated based on a subject's call activities. An assignment of CCCs is triggered by the appearance of a call content source or a feature associated activity. A call content source generally appears as a result of an incoming or outgoing call attempt. All appearances do not result in a CCC assignment; instead, a previously assigned CCC may be used. Activation of a CCC refers to the start of delivery of call content over the assigned CCC.

**R5-10 The idle CCC shall be assigned in ascending order starting with available and in-service CCC with the lowest CCCId value.**

**R5-11 Assignment of a CCC shall be signaled to an LEA by the SIMPLE Connection Activated Message (CAM) and by the removal of C-tone from the CCC.**

**R5-12 Whenever a subject uses flash hook or triggers a FLASH event, a 0.25-second C-tone burst shall be applied on the subject's transmit and receive CCCs.**

Assignment and activation of a CCC vary for originating and incoming call attempts.

### 5.4.1 Origination Call Attempts

Whenever a subject attempts to originate a call from a previously idle state, a combined CCC or pair of separated CCCs shall be assigned. Each B channel on an ISDN subject is considered a separate line (i.e., capable of supporting a separate call).

**R5-13 Whenever a subject attempts to originate a call from a previously idle state, a new combined CCC or pair of separated CCCs shall be assigned to deliver the subject's transmit and receive communications paths.**

Call content should be delivered during the initial call origination request.

**R5-14 CCCs to deliver a subject's transmit and receive communications paths shall be activated during the initial call origination request.**

The subject's originating call attempts using conference calling services (e.g., three-way calling, six-way calling) shall result in the assignment of one or more additional CCCs. These services allow the subject to communicate with one or more associates. The CCCs used for delivering the subject's transmit and receive communications paths should always follow the subject's activity. The talk paths of associates in a conference call should be delivered either combined over one CCC or separated over multiple CCCs. The number of CCCs will depend on the type of conference calling service.

**R5-15 Whenever a subject attempts to originate a call from an active call connection using a conference calling service, the CCCs assigned to deliver the subject's transmit and receive communications paths shall follow the subject's activity.**

**R5-16 One or more CCCs shall be used to deliver the call content of the associates involved in a conference call initiated by a subject. An LEA shall have the option of receiving the talk paths of associates combined and delivered over one CCC or separated and delivered over multiple CCCs.**

**R5-17 If a subject's service allows the subject to converse with one associate while another associate is on hold but does not allow conference capability (e.g., call waiting, call hold), no additional CCCs shall be assigned to monitor the held associate.**

### 5.4.2 Incoming Call Attempts

CCC assignment on incoming call attempts is dependent on how the incoming call is handled. To monitor call progress signals or announcements transmitted to the associate during call setup, rules exist to prevent duplicate assignment of CCCs for a call connection. There are several incoming call cases that must be considered:

- An incoming call attempt to a subject's idle line

- An incoming call attempt to a subject already in a call connection with or without additional call handling capabilities
- An incoming call attempt to a subject that is redirected.

When an incoming call attempt is made to a subject's idle line, there is the possibility that the call will be answered by the subject. Therefore, CCCs shall be assigned as soon as it is determined that the subject's line is idle.

**R5-18 All incoming call attempts to a subject's idle line shall result in an assignment of CCC(s) to deliver subject's transmit and receive communications paths.**

To monitor the call progress signals or announcements heard by the calling associate, the CCC assigned to deliver subject's transmit communications path should be used before the subject answers. The receive path for incoming calls to the subject should be provided no later than the answer event. A call is considered answered when the first connection supporting bidirectional communications is established.

**R5-19 On an incoming call attempt to a subject's idle line, if the call progress signals or announcements to the calling associate are given at the IAP, the CCC assigned to deliver subject's transmit communications path shall be activated immediately to deliver those signals.**

**R5-20 The CCC assigned to deliver subject's receive communications path shall be activated no later than when the subject or subject's agent answers the call attempt.**

Incoming call attempts to a subject that is already in an active call connection with no additional call handling capabilities (e.g., no call waiting, cancel call waiting) result in giving a busy signal to the calling associate. Given that call-identifying information will be generated for this call attempt and that the call attempt cannot be answered by the subject, additional CCCs are not necessary.

**R5-21 Incoming call attempts to a subject in an active call connection with no additional incoming call handling capabilities shall not result in the assignment of additional CCCs.**

A subject with additional call handling capabilities, such as call waiting service, has the ability to receive additional calls while in an active call. To receive the additional call, the subject puts the first associate on hold. The CCC should follow the subject's activity; therefore, the same CCC should be used as assigned to the first active call.

A redirected call connection can occur in parallel while the subject has an active call connection. To monitor a redirected call, additional CCCs may need to be assigned. Redirection can occur immediately, as in the case of call forwarding busy line, or after a predetermined number of rings, as in the case of call forwarding no answer.

**R5-22 In general, additional CCCs shall be assigned when an incoming call attempt is redirected. However, for certain redirection features (e.g., call forwarding no answer), the CCCs previously assigned to handle the incoming call attempt shall be used.**

**R5-23 If an incoming call attempt to a subject is redirected, the CCC assigned to deliver forwarded-to associate's receive communications path shall be activated no later than when the associate or associate's agent answers the call attempt.**

A subject may choose to redirect an answered call to another associate using some variation of a call transfer service. This should not cause assignment of additional CCCs. However, the existing CCCs should follow the new call connection.

**R5-24 Whenever a subject redirects an active call using a call transfer service, the CCCs assigned to deliver the subject's transmit and receive communications paths shall follow the new call connection.**

## 5.5 Exhaustion of Call Content Channels

In certain circumstances, CCCs may not be available for a new call connection. This may occur when all CCCs initially provisioned for a surveillance are in use and a new call connection occurs. In this scenario, call content for the new call connection will not be delivered to the LEA until a CCC becomes available. There is no requirement for storing the call content and delivering it at a later time. However, the request to deliver the call content should be placed in a queue.

**R5-25 When no CCCs are available to assign to a new call connection, the delivery request for the call connection shall be placed in a first-in first-out (FIFO) queue awaiting the release of CCCs.**

**R5-26 When a CCC becomes available, the oldest call connection in the queue shall be assigned and activated on the idle CCC.**

## 5.6 Deactivation and Release of Call Content Channels

Deactivation and release of a CCC occurs when delivery of call content is stopped, and the CCC is made available for delivering new call connections. Each CCC is deactivated independently after the end of a call connection.

**R5-27 A CCC shall be deactivated and released within 500 milliseconds after the call content source ceases to exist at the IAP.**

**R5-28 Release of a CCC shall be signaled to an LEA by sending the SIMPLE Connection Cleared Message (CCM) over the CDC and by re-applying continuous C-tone on the idle CCC.**

## 5.7 Mapping of Call Content Channels to ESI Physical Delivery Options

CCCs are transported to law enforcement over circuits described by one of the physical delivery interfaces. CCCId must also be associated with a physical circuit, channel, or timeslot being delivered to an LEA.

**R5-29 A single CCC shall be provided over one ESI analog wireline interface circuit.**

**R5-30 A single CCC or a portion of a multislot CCC shall be provided over one channel of the ESI DS1 interface.**

Cross-technology delivery is the delivery of call content over a physical interface that differs from that used by the subject. For example, the call content from a subject using an analog line can be delivered not only across the ESI analog wireline interface, but also across the ESI DS1 interface. Cross-technology delivery cannot occur with all combinations of communications technologies, but certain combinations can facilitate cost-effective means of delivering call content.

**R5-31 If a subject is using a communications technology that is compatible with either the ESI analog wireline interface or the ESI DS1 interface, the TC shall support both ESI physical interfaces for the delivery of call content.**

**R5-32 If a subject is using a communications technology that is not compatible with the ESI physical delivery interfaces, the TC shall support either the same technology as the subject for the ESI delivery interface or a suitable alternative.**

## 5.8 Performance of Call Content Channels

The following sections define performance criteria for CCCs to ensure reliable and effective delivery of a subject's call content.

### 5.8.1 Encoding of Call Content Signals

Many transport facilities in the network require analog signals to be digitized and encoded for more efficient, reliable, and cost-effective delivery.

**R5-33 If digital encoding needs to be performed on the call content signal for the delivery to law enforcement, the encoding method shall conform to the $\mu$-law of ITU-Recommendation G.711, *Pulse code modulation (PCM) of voice frequencies.***

During transit through a TC network, various facilities might be encountered that use other coding or transcoding methods, such as 32 kbits/sec Adaptive Pulse Code Modulation for speech.

**R5-34 After the call content signal is converted into a digital bit stream, transcoding shall not degrade the quality of delivered call content beyond that of applicable industry standards.**

### 5.8.2 Signal Attenuation

Depending upon the physical facilities used to deliver the CCC, varying degrees of signal attenuation and distortion could be introduced. Attenuation of the call content signal may occur as the result of network loss plans and the degree of attenuation may be based on the type of transmission facility.

**R5-35 If call content is transported through the PSTN, the network transmission performance shall conform to applicable industry standards for network performance loss plans.**

The local loop loss refers to the signal attenuation that occurs between the end user terminal and the network. The TC should attempt to deliver the call content by routing it through facilities that minimize signal attenuation.

**R5-36 There shall be no more than 6 dB of total local loop loss at 1633 Hz between the TC's delivery point and the LEA collection equipment for the ESI analog wireline interface.**

**R5-37 There shall be no more than 2 dB of total local loop loss at 1633 Hz between the TC's delivery point and the LEA collection equipment for the ESI DS1 interface.**

### 5.8.3 Blocking

One key factor that affects the ability to conduct a surveillance is the failure to receive call content due to network blocking conditions. Because network elements are shared resources that utilize concentration techniques, calls may be blocked under certain conditions.

**R5-38 The potential for blocking of call content delivery in the network element intercepting a subject's call content shall be less than or equal to that of other services provided by the network element.**

**R5-39 The TC shall allow an LEA to choose a higher class of service, if available, for the physical circuits used for the delivery of call content to minimize the potential of network blocking.**

### 5.8.4 Clipping of Call Content

Clipping of call content refers to the loss of any portion (i.e., the beginning, middle, or end) of a call. In general, clipping is not acceptable to law enforcement. However, law enforcement recognizes that if sufficient number of CCCs are not provisioned at the activation of a surveillance, there is a possibility for clipping of call content for certain calls.

**R5-40 If private, dedicated circuits are used for delivering call content, there shall be no clipping of call content.**

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# 6. Delivery of Call-identifying Information

Delivery of call-identifying information involves a data transfer protocol, a physical interface for delivery, and a message protocol to format the information. The CDC interface is a generic term used in this section for the call-identifying information delivery interface. The X.25 protocol is selected as the data transfer protocol for the CDC interface. In the future, an application layer protocol that is based on Open Systems Interconnection (OSI) standards, such as Remote Operations Service Element (ROSE) or File Transfer, Access, and Management (FTAM), may be used for the delivery of call-identifying information.

**R6-1 A CDC shall be used to transport call-identifying information for all active surveillances from a delivery point in a TC network to an LEA location.**

**R6-2 The call-identifying information associated with a single surveillance shall be provided to an LEA over a single CDC.**

## 6.1 X.25 Interface

An X.25 interface is used for the delivery of call-identifying information from a TC network to an LEA.

**R6-3 The TC shall support an X.25 interface that conforms to ITU-T Recommendation X.25, *Interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit.***

### 6.1.1 Packet Layer

The packet layer formats the packets and controls the procedures for exchanging packets between the DTE and the DCE. Several administrative packets are supported at this layer to support the successful and reliable exchange of information.

**R6-4 All SIMPLE messages shall be encapsulated in the user data field of X.25 data packets, as defined in ITU-T Recommendation X.25.**

As defined in Section 4.3.2 of ITU-T Recommendation X.25, the user data field length can vary from 16 to 4,096 octets by discrete factors of two. To minimize the number of SIMPLE packets transmitted from the TC network to an LEA, a packet size that can completely encapsulate the majority of SIMPLE messages should be used.

**R6-5 The X.25 interface shall support a data packet size of at least 256 octets.**

The virtual connection method used for the X.25 interface should be either a Permanent Virtual Circuit (PVC) or a Switched Virtual Call service (SVC). PVC allows a virtual connection to remain active for the duration of the surveillance. An SVC allows a virtual connection to be created when call-identifying information is available for delivery. Section 4.1 of ITU-T Recommendation X.25 defines the procedures for the SVC, and Section 4.2 defines the procedures for the PVC.

Regardless of how it is established, each virtual circuit should carry all the call-identifying information associated with at least one surveillance for an LEA. If, for instance, a subject has

multiple call connections active, the call-identifying information for each call should be delivered to the LEA over the same virtual circuit.

**R6-6 The X.25 interface shall support either a PVC or SVC as defined in Sections 4.1 and 4.2 of ITU-T Recommendation X.25.**

Multiplexing of the CDCs associated with several surveillance activities onto a single X.25 interface should be supported. Each CDC associated with a surveillance should be assigned its own virtual circuit on the same physical connection so that it can be multiplexed. This type of multiplexing occurs at the X.25 packet layer, where each CDC is assigned a logical channel number for each virtual call.

**R6-7 The X.25 packet layer shall support logical channel assignments consistent with Section 3.1 of ITU-T Recommendation X.25.**

Before data transfer can begin the packet layer must be initialized by restarting the link.

**R6-8 The X.25 interface shall support the restart procedures defined in Section 3.3 of ITU-T Recommendation X.25.**

**R6-9 The X.25 interface shall reserve logical channel zero (0) on the data link layer control connection for restart information.**

In general, the procedures for data transfer defined in Section 4.3 of ITU-T Recommendation X.25 should be followed.

**R6-10 The X.25 interface shall support the procedures associated with the use of the Delivery Confirmation bit (D bit) for end-to-end acknowledgment of packet delivery as described in Section 4.3.3 of ITU-T Recommendation X.25.**

**R6-11 The X.25 interface shall support the procedures associated with the complete packet sequence mechanism as described in Section 4.3.5 of ITU-T Recommendation X.25.**

**R6-12 The X.25 interface shall support the procedures associated with the use of the Qualifier bit (Q bit) as described in Section 4.3.6 of ITU-T Recommendation X.25.**

**R6-13 The Q bit shall be set to zero (Q=0) when encapsulating SIMPLE messages.**

The Interrupt/Interrupt Confirmation packets should be used to relieve flow control or congestion problems on an individual virtual circuit without resetting or clearing that virtual circuit. Interrupt packets should be used when the delivery point has not received confirmation of its previously transmitted sequenced SIMPLE packets.

**R6-14 The X.25 interface shall support the procedures associated with the use of Interrupt/Interrupt Confirmation packets as described in Section 4.3.7 of ITU-T Recommendation X.25.**

Each data packet containing SIMPLE messages should be numbered using the modulo 8 scheme, where the numbers cycle through the entire range of 0 to 7.

**R6-15 The X.25 interface shall support the modulo 8 data packet sequence numbering as described in Section 4.4.1.1 of ITU-T Recommendation X.25.**

The Receiver Ready/Receiver Not Ready packets should be used to perform "stop/start" flow control for each virtual circuit.

**R6-16 The X.25 interface shall support the procedures associated with the use of Receiver Ready/Receiver Not Ready packets as described in Section 4.4.1 of ITU-T Recommendation X.25.**

**R6-17 The X.25 interface shall support the reset procedures for virtual circuits as defined in Section 4.4.3 of ITU-T Recommendation X.25.**

**R6-18 The following default X.25 packet layer parameters shall be supported:**

| | |
|---|---|
| **Connection:** | **Switched or Permanent Virtual Circuit** |
| **Packet Sequencing:** | **Modulo 8 (Modulo 128 Optional)** |
| **Logical Channels:** | **1 per surveillance(s)** |
| **Minimum Packet Size:** | **256 Octets** |
| **Window Size:** | **2** |
| **User Data Alignment:** | **Octet-Aligned** |

### 6.1.2 Data Link Layer

Link Access Procedures (LAPB) are used for data link control for the transfer of data over physical circuits. All X.25 data packets are encapsulated in High-Level Data Link Control (HDLC) frames.

**R6-19 The X.25 interface shall support the LAPB procedures as defined in Section 2 of ITU-T Recommendation X.25 for the data link layer control.**

**R6-20 All data packets carrying SIMPLE messages shall be mapped into the information field of an HDLC Information frame.**

**R6-21 The following default values shall be supported for the LAPB system parameters as defined in Section 2.4.8 of ITU-T Recommendation X.25:**

| | |
|---|---|
| **Link Procedure:** | **Single Link Procedures (SLP)** |
| **Frame Sequencing:** | **Modulo 8 (Modulo 128 Optional)** |
| **K Parameter:** | **7 (Settable from 1 to 7 for Modulo 8; Settable from 1 to 127 for Modulo 128)** |
| **T1 Parameter:** | **2 seconds** |
| **T2 Parameter:** | **< 0.4 seconds** |
| **T3 Parameter:** | **10 seconds** |
| **N1 Parameter:** | **2120 bits (265 octets)** |
| **N2 Parameter:** | **3** |

### 6.1.3 Physical Layer

The X.25 interface should support several interface options at the physical layer based on the operational needs of law enforcement.

**R6-22 The physical X.25 interface shall conform to Section 1.1, X.21 interface; Section 1.2, X.21 bis interface; and Section 1.3, V-Series interface of ITU-T Recommendation X.25.**

## 6.2 Mapping of CDC Interface to ESI Physical Delivery Options

The ESI physical delivery interfaces should support the delivery of call-identifying information to law enforcement.

### 6.2.1 ESI Analog Wireline Interface

An ESI analog wireline interface may be used for the X.25 interface through an analog modem connection to an X.25 access port. The phrase "analog modem connection" describes a voice band data connection between an analog modem at the LEA's collection site and a compatible peer analog modem at the delivery point. The ESI analog interface connection is expected to be a synchronous connection.

**R6-23 The CDC interface shall be supported over the ESI analog wireline interface.**

Synchronous connections should be provided through direct access. The phrase "direct access" describes a dedicated connection through the PSTN that permanently connects an analog line and modem to the PSPDN. Law enforcement and the PSPDN will negotiate the establishment of this permanent, dedicated connection when the CDC interface is first installed and configured.

**R6-24 Synchronous connections shall be supported for the X.25 interface over an analog modem connection to an LEA.**

The data rate of the analog modem connection depends on the data rates supported by the peer PSPDN. Given current trends in modem technology, the analog modem connection for the CDC interface is expected to support rates of 9,600, 14,400, and 28,800 bits/sec or higher.

**R6-25 Synchronous modems conforming to ITU-T Recommendations V.32, V.32 bis, and V.34 shall be supported.**

**R6-26 A single LAPB for data link layer connection supporting one or more virtual circuits shall be supported over an analog modem.**

### 6.2.2 ESI DS1 Interface

Call-identifying information can be delivered over the ESI DS1 interface in a variety of ways. Some possible transport methods on a channelized DS1 interface include analog and synchronous digital data.

**R6-27 The channelized ESI DS1 interface shall support delivery of call-identifying information over an analog interface and over one or more timeslots of synchronous digital data interface.**

**R6-28 A single LAPB for data link layer connection supporting one or more virtual circuits shall be supported over each DS1 channel.**

The DS1 interface provides significant bandwidth so that information for multiple surveillances can be combined on this interface for delivery to law enforcement. The digital connections should support data rates of 48, 56, and 64 kbits/sec or higher.

**R6-29 The CDC over DS1 interface shall conform to ITU-T Recommendation V.38, *A 48/56/64 kbit/s data circuit terminating equipment standardized for use on digital point-to-point leased circuit.***

## 6.3 Delivery of Call-identifying Information after CCC Exhaustion

Circumstances may occur in which no CCCs are available to deliver the call content from a new call connection. Although call content for this connection cannot be delivered to law enforcement until CCCs become available, call-identifying information for this connection should continue to be delivered over the CDC.

**R6-30 Call-identifying information shall continue to be delivered to the LEA even after all CCCs for a surveillance have been exhausted.**

## 6.4 Correlation of Call-identifying Information and Call Content

The correlation of call-identifying information and call content refers to the establishment of the relationship between the occurrence of an event in the IAP that corresponds to the communications on the CCC and the delivery of SIMPLE messages on the CDC. Delays in the delivery of SIMPLE messages can cause a major problem in law enforcement's ability to conduct surveillance.

**R6-31 The timestamp used in SIMPLE messages shall be within 100 ms of the actual time when the event occurred in the IAP.**

**R6-32 The maximum delay between the occurrence of an event and the delivery to an LEA of the associated SIMPLE message shall be 500 ms.**

## 6.5 Provisioning of CDC Interface

The provisioning of the CDC interface involves establishing a physical connection between a TC network and an LEA.

**R6-33 The TC shall support either a direct X.25 connection or an X.25 connection through an LEA-specified PSPDN to establish the physical CDC interface.**

**R6-34 The TC shall establish either a new X.25 connection or a new virtual connection (PVC or SVC) over an existing X.25 connection for each surveillance as requested by the LEA.**

Law enforcement collection equipment will need to be assigned a network address if the equipment is connected to the TC network.